

# NITROGEN CYCLING AT YUNGAY IN THE ATACAMA DESERT

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Nitrogen is an essential element for life. Consequently, understanding the nitrogen cycle is critical to understanding the origin and evolution of life. The Atacama desert in Chile is a large  $\text{NO}_3^-$  salt deposit that is stable through geologic time. This deposit is of particular interest as an analog and model for planets, or niches of limited biological activity. Although hypotheses have been presented for the  $\text{NO}_3^-$  stability, i.e., low rainfall and little biological activity, none have been proven. We analyzed Yungay, the driest area of the Atacama. Rates of denitrification were determined using acetylene to block the reduction of  $\text{N}_2\text{O}$  to  $\text{N}_2$ . Soil samples were placed into Whirl-pak® bags fitted with syringe septa, and incubated for at least 10 hours, dry, wet, anaerobic, or aerobic. Controls were run similarly with no acetylene. Periodically, gas samples were collected and analyzed via gas chromatography. Rates of nitrogen fixation were determined similarly using the acetylene reduction method. No nitrogen fixation was detected, which is not surprising due to the abundance of  $\text{NO}_3^-$ . The denitrification tests were negative. The negative result from the anaerobic wet test suggests that low water activity alone cannot account for the lack of denitrification in this system. This is the only place in the world where denitrification cannot be detected in the presence of nitrate anaerobically. Denitrifiers are ubiquitous and should be in the atmosphere and falling to the surface of the desert. We are attempting to do determine why no biological denitrification occurs in this system.